



Florida Department of Agriculture & Consumer Services
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Frequently Asked Questions about Dimethyl Disulfide

1. What is dimethyl disulfide?

Dimethyl disulfide (DMDS) is a recently registered soil fumigant approved for pre-plant use on agricultural fields. In addition, DMDS can occur naturally in soil, wetlands, oceans and outdoor air, and plays a role in the global sulfur cycle. DMDS is also naturally produced by some plants, including certain food crops, and can be present in certain dairy products. In the United States and Europe, DMDS is an approved food additive used for flavoring.

2. What DMDS products are registered in Florida?

In May 2011, the Florida Department of Agriculture and Consumer Services (FDACS) granted Arkema, Inc. conditional registration of technical DMDS and two fumigation products: Paladin® (98.8% DMDS) and Paladin® EC (93.8% DMDS). Both of these products are registered to control pre-emergent weeds, soil-borne plant pathogens, and nematodes in soils used to grow vegetables, cucurbits, strawberries, blueberries, field-grown ornamentals and forest nursery stock. These formulations may be used alone or in combination with chloropicrin, another fumigant, for greater overall effectiveness.

3. Why is DMDS needed for Florida agriculture?

Broad-spectrum agricultural fumigants, like DMDS, are needed in Florida because of the high pest pressure here, where non-chemical alternatives are not always possible or practical for all crops. With the gradual phase out of the highly effective fumigant, methyl bromide, there is growing need for alternative fumigants. DMDS has been marketed as one of those alternatives.

4. Where, when and how is DMDS applied?

Prior to planting, DMDS is either injected beneath the soil surface with specialized application equipment or it is applied to the soil surface through a drip irrigation line. Once the DMDS has been applied, the treated area is immediately covered with a plastic tarp to help retain the fumigant in the soil and improve efficacy.

5. Can DMDS get into food crops?

The EPA concluded that DMDS fumigant is not likely to get into food crops. Because DMDS can damage crops, Paladin® is applied prior to planting. Planting can only take place a minimum of 21 days after fumigation to allow DMDS levels in the soil to decrease to a safe level. DMDS quickly breaks down into low toxicity or non-toxic degradates and metabolites that are further broken down. (These compounds may also be part of a normal diet.)

6. Is DMDS likely to get into ground or surface water?

A qualitative EPA assessment concluded that DMDS will not contaminate ground water or surface water. FDACS conducted computer simulations assuming reasonable worst-case Florida environmental conditions and confirmed that DMDS is unlikely to adversely affect the quality of ground water or surface water. FDACS also evaluated the fate of methanesulfonic acid (MSA), the major degradate of DMDS. MSA is produced naturally in the environment as part of the sulfur cycle and generally exhibits low to moderate toxicity. However, it can be mobile in soil and relatively persistent compared to DMDS. Although more mobile, MSA also poses minimal risks to water quality.

7. How can DMDS affect human health?

Most agricultural fumigants, including DMDS products, generally are of low to moderate toxicity. However, because they are used to control a wide range of pests, large quantities are applied to agricultural fields, making them potentially hazardous. By most measures, the toxicity of DMDS is similar to or less than that of methyl bromide and other agricultural fumigants. DMDS has low toxicity when inhaled or when the skin is exposed to it. The primary health effect of DMDS is irritation of the nose and upper respiratory tract. The EPA concluded that a concentration of DMDS in air of 55 parts per billion (ppb) or less is not expected to cause irritation or other health effects. DMDS is moderately irritating to the eyes and is minimally irritating to skin with normal low concentration, short-term exposure. DMDS has not been shown to cause allergic sensitization, birth defects, reproductive toxicity or mutagenicity. The EPA concluded that people in areas near treated agricultural fields will not experience adverse health effects when DMDS products are used according to the stringent requirements of their product labels. Workers are required to wear personal protective equipment to prevent harmful exposures.

8. What about the odor of DMDS?

DMDS has a sulfurous odor similar to that of garlic and decaying fish. Because of the distinctive odor of sulfur compounds, similar to DMDS, they are often added to natural gas and propane to warn of leaks and protect people. Therefore, the odor of a DMDS fumigation can be mistaken for a gas leak. DMDS has an odor threshold of approximately 7 ppb, which is about 8 times less than the health-based level considered by the EPA to be safe (55 ppb). Since the odor threshold for DMDS is much lower than levels potentially affecting human health, under certain environmental conditions, unpleasant odors may occur in and around use areas for short periods of time, despite buffer zones to protect bystanders from adverse health effects. In sensitive people, the odor of DMDS may result in nausea, headache, drowsiness or dizziness. FDACS required the registrant to provide air modeling to predict the distance from application that DMDS odor might be detected in order to better characterize whether or not DMDS is the source of a nuisance odor complaint. NOTE: FDACS also required the registrant to advise emergency responders prior to product use and to promptly respond to and report any odor complaints.

9. Is dimethyl disulfide likely to adversely affect wildlife and the environment?

Since dimethyl disulfide is injected beneath the soil surface and immediately covered with a tarp, high concentrations are unlikely to come into contact with wildlife. The tarp significantly slows the movement of dimethyl disulfide to the atmosphere. Toxicity and environmental

monitoring show that dimethyl disulfide should not reach levels that would harm wildlife or aquatic organisms.

10. What has the EPA done to ensure the safe use of DMDS in the U.S.?

The EPA has taken steps to ensure the compliant and safe use of DMDS. First, EPA requires and reviews numerous scientific studies for registration. These studies quantify the potential toxicity to people and animals and characterize DMDS' environmental fate in soil, water, and air. Taken together, the EPA can then predict exposures and mitigate unacceptable risks. Second, like all other fumigants, DMDS is a restricted use pesticide that can only be used under the direct supervision of certified applicators that have undergone extensive training on requirements that apply prior to, during, and following soil treatment. Third, the EPA has required several new safety requirements for DMDS and other agricultural fumigants. One new requirement is the inclusion of a "buffer zone" surrounding the field in which bystanders and unprotected workers cannot enter for 48 hours after the end of the application. The size of the buffer zone depends on the area being fumigated, the amount of DMDS being applied per acre and other factors. Fourth, the Paladin® products cannot be applied within a quarter mile of nursing homes, hospitals, licensed schools, licensed day care facilities, licensed assisted living facilities (licensed by State or local governments) or prisons that will be occupied during the buffer zone period. Buffer zone perimeters must be clearly posted or otherwise controlled to restrict entry.

11. What has the Florida Department of Agriculture and Consumer Services done to ensure the safe use of DMDS in Florida?

Over a period of eight months, FDACS conducted a comprehensive, new active ingredient review examining a wide array of studies provided by the registrant and from the open scientific literature. The Department also reviewed the EPA's risk assessment and risk mitigation measures for DMDS. FDACS engaged in numerous discussions on DMDS with a number of diverse groups, including the DMDS registrant, the EPA, the Florida Department of Health, the Florida Department of Environmental Protection, the Florida Fish and Wildlife Conservation Commission, Florida growers, the University of Florida, and Florida farm worker advocates. Florida's review process resulted in various conditions being required of the registration. Of particular interest was a requirement that the registrant carry out a robust product stewardship program in Florida to assist applicators in the proper use of the product. Also, as a condition of registration, the registrant committed to audit at least 10 applications to make sure their training is working and their product is being properly applied.

12. What can I do if I believe that DMDS might be making me sick?

If you are ill, you should call your doctor. You can also call your county health department, or the Florida DOH Bureau of Epidemiology, Pesticide Surveillance Program's toll-free number at 1-800-606-5810. Or you can call the Florida Poison Information Center at 1-800-222-1222.

13. Where can I find additional information about DMDS?

Further information on DMDS can be found at these internet websites:

http://www.epa.gov/pesticides/chem_search/reg_actions/pending/fs_PC-029088_09-Jul-10.pdf

http://iaspub.epa.gov/apex/pesticides/f?p=CHEMICALSEARCH:3:0::NO:1,3,31,7,12,25:P3_XCHEMICAL_ID:2214
<http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2007-0092-0028>
<http://www.regulations.gov/> (Type “dimethyl disulfide” in the search box)
<http://toxnet.nlm.nih.gov/> (Type “dimethyl disulfide” in the search box)

If you have additional questions, please contact the Bureau of Pesticides at (850) 617-7917.